ABSTRACT

An apparatus and method for an efficient, passively Q-switched microlaser producing high peak power pulses of light of extremely short duration are disclosed. This microlaser utilizes Yb^{3+}:YAG as the gain medium instead of conventionally used Nd^{3+}: YAG or Nd^{3+}:YVO_4 gain media The utilization of the Yb^{3+}:YAG allows superior performance of high peak-power microlaser in many aspects with respect to conventionally used Nd^{3+}:YAG as the gain media. The efficiency of the pump of said microlaser (the so called optical-to-optical efficiency) can be higher by factor of two to four, with respect to Nd:YAG based, provided all other output parameters such as pulsewidth, output peak power and spatial quality of the beam being equal. The improved efficiency allows reducing the cost and size of the whole microlaser system substantially. In addition to lowering the cost of the microlaser system by factor of two to three, the temperature stability of the proposed microchip laser improved by factor of 5, due to the wider absorption bandwidth of the Yb^{3+}:YAG to those of Nd^{3+}: YAG or Nd^{3+}:YVO_4.